

# Problem 16.1

Convert to Decimal

a) 1110101.0110

~~1110101.0110~~

$$1 \times 2^6 + 1 \times 2^5 + 1 \times 2^4 + 0 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0 = 117$$

$$0 \times 2^{-1} + 1 \times 2^{-2} + 1 \times 2^{-3} + 0 \times 2^{-4} = 0.375$$

$$117.375$$

b) 11.01010101...

$$3. \quad 2^{-2} + 2^{-4} + 2^{-6} + 2^{-8} + 2^{-10} + \dots = 3.33$$

c) ~~2~~  $2 \times 16^1 + 10 \times 16^0 = 32 + 10 = 42$

Convert to Binary

a) 1023 ~~2~~ / 2 = 511

|         |     |   |
|---------|-----|---|
| 511/2 = | 255 | 1 |
| 255/2 = | 127 | 1 |
| 127/2 = | 63  | 1 |
| 63/2 =  | 31  | 1 |
| 31/2 =  | 15  | 1 |
| 15/2 =  | 7   | 1 |
| 7/2 =   | 3   | 1 |
| 3/2 =   | 1   | 1 |
| 1/2 =   | 0   | 1 |

b) 1111111111111111  
3 F F

|   |        |
|---|--------|
| $1 \times 16^3 + 0 \times 16^2 + 2 \times 16^1 + 3$ |        |
| 4131/2 =  | 2065 1 |
| 2065/2 =  | 1032 1 |
| 1032/2 =  | 516 0  |
| 516/2 =   | 258 0  |
| 258/2 =   | 129 0  |
| 129/2 =   | 64 1   |
| 64/2 =  | 32 0   |
| 32/2 =  | 16 0   |
| 16/2 =  | 8 0    |
| 8/2 =   | 4 0    |
| 4/2 =   | 2 0    |
| 2/2 =   | 1 0    |

Convert to Hex

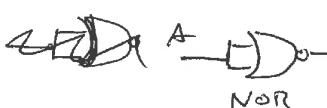
a) 1023  $\rightarrow$  11111111 = 3FF

b) 101110101101 = BAD

c) 61453/16 = 3840 13 (b)  
3840/16 = 240 0  
240/16 = 15 0  
F

FOOD

# Problem 16.7

A) 

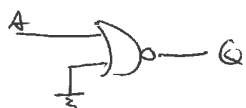
| A | Q |
|---|---|
| 0 | 0 |
| 1 | 1 |

 invert!

B) 


| A | Q |
|---|---|
| 0 | 0 |
| 1 | 1 |

 Nothing!

C) 

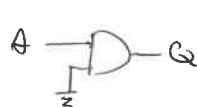
| A | L | Q |
|---|---|---|
| 0 | 0 | 1 |
| 1 | 0 | 0 |

 invert!

D) 

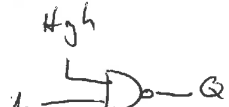
| A | H | Q |
|---|---|---|
| 0 | 1 | 0 |
| 1 | 1 | 0 |

 zero!

E) 

| A | L | Q |
|---|---|---|
| 0 | 0 | 0 |
| 1 | 0 | 0 |

 zero

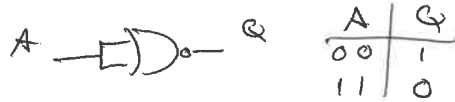
F) 

| A | H | Q |
|---|---|---|
| 0 | 1 | 1 |
| 1 | 1 | 0 |

 invert!

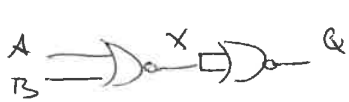
# Problem 10.8

a) Invert from NOR



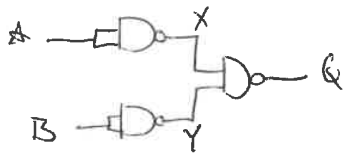
| A | Q |
|---|---|
| 0 | 1 |
| 1 | 0 |

b) OR from NOR



| A | B | X | Q |
|---|---|---|---|
| 0 | 0 | 1 | 0 |
| 0 | 1 | 0 | 1 |
| 1 | 0 | 0 | 1 |
| 1 | 1 | 0 | 1 |

c) OR from NAND



| A | B | X | Y | Q |
|---|---|---|---|---|
| 0 | 0 | 1 | 1 | 0 |
| 0 | 1 | 1 | 0 | 1 |
| 1 | 0 | 0 | 1 | 1 |
| 1 | 1 | 0 | 0 | 1 |

# Problem 16.9

a) 3 input AND from 2 input ANDs

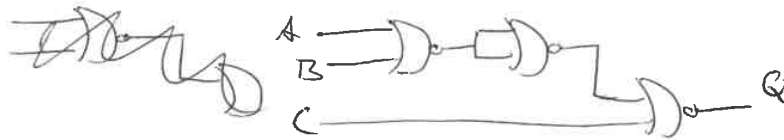


| A | B | X | C | Q |
|---|---|---|---|---|
| 0 | 0 | 0 |   | 0 |
| 0 | 1 | 0 |   | 0 |
| 1 | 0 | 0 |   | 0 |
| 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 0 | 0 |

b) 3 input OR from 2 input ORs



c) 3 input NOR from 2 input NOR



d) 3 input ~~AND~~ from 2 input NAND

AND from NAND

